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Gnaphalio uliginosi-eleocharitetum acicularis PASSARGE 1999, NEW PLANT COMMUNITY IN POLAND

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Abstract. Water reservoirs are very valuable floristic sites in Poland. Among them, the most important for preservation of biodiversity of flora are fishponds. The long-term process of human pressure on habitats of this type caused disturbance of their biological balance. Changes in the water regime, industrial development and chemisation of agriculture, especially in the period of last two centuries, led to systematic disappearance of localities of many plant species and plant communities. *Gnaphalio uliginosi-Eleocharitetum acicularis* Passarge 1999, of *Isoëto-Nanojuncetea* class Br.-Bl. et Tx. 1943, was firstly described in Germany. This association grows on sandy or sandy-gravely banks of rivers and in old river beds. In Poland, *Gnaphalio uliginosi-Eleocharitetum acicularis* has not been found so far. The patches of this type have been described many times, but otherwise classified acording to syntakxonomical system. During current vegetation research the association *Gnaphalio uliginosi-Eleocharitetum acicularis* was found in seven fish-breeding ponds in south-western Poland. Fieldworks were conducted in 2000–2016.

Key words: *Isoëto-Nanojuncetea* class, annual wetland herbs, fish-breeding ponds, distribution, phytosociology, Central Europe

INTRODUCTION

Water reservoirs are very valuable floristic sites in Poland. Among them, the most important for preservation of biodiversity of flora are fish-breeding ponds. The long-term process of human pressure on habitats of this type caused disturbance of their biological balance. Currently in this country, fish ponds are among the most valuable areas where aquatic, reed and other wetland vegetation occur. This situation necessitates integration of economic activities related to fish farming and the activities aimed at environmental protection. The process of disappearance of species associated with wetland habitats can be effectively eliminated only through agreement between pond owners and wildlife protection services, based on a thorough analysis of both environmental phenomena

and economic needs. Changes in the water regime, industrial development and chemisation of agriculture, especially in the period of last two centuries, led to systematic disappearance of localities of many plant species and plant communities [e.g. Tomaszewicz and Kłosowski 1985, Szumiec 1995, Falkowski and Nowicka-Falkowska 2001, 2004, Spałek 2005, 2006, 2009, Spałek and Nowak 2003, Richert *et al.* 2016]. The *Gnaphalio uliginosi-Eleocharitetum acicularis* Passarge 1999, of the *Elatini-Eleocharition ovatae* Pietsch 1965 alliance and the *Isoëto-Nanojuncetea* class Br.-Bl. et Tx. 1943, was firstly described in Germany [Passarge 1999]. Phytocenoses with relevant species composition have been documented already before the association's description [e.g. Jage 1964, Passarge 1965, Popiela 1996, 1997, 1999]. The stands of this association grow on sandy or sandy-gravel banks of rivers and in old river beds [Passarge 1999]. So far, two subassociations were distinguished. In Germany, phytocenoses of this association are in danger of extinction [Passarge 1999]. In Poland, *Gnaphalio uliginosi-Eleocharitetum acicularis* has not been found so far. The species characteristic for this association – *Gnaphalium uliginosum* [Passarge 1999] is known in whole Poland and is rather rarely found only in the north-eastern part of the country [Zając and Zając (eds.) 2001]. It most often grows in open, damp places with sandy or sandy-muddy soil. It is mainly found in communities of *Isoëto- Nanojuncetea* and *Littorelletea uniflorae* class [Dostál 1989, Oberdorfer 1994, Pott 1995, Popiela 1997, 1999, 2005, Passarge 1999, Matuszkiewicz 2005, Šumberová 2011].

The aim of the study was to present the current distribution in Poland plant association – *Gnaphalio uliginosi-Eleocharitetum acicularis*.

MATERIAL AND METHODS

The fieldwork was conducted during the growth seasons in 2010–2016. *Gnaphalio uliginosi-Eleocharitetum acicularis* community was studied with the methods of the Zurich-Montpellier School of Phytosociology [Braun-Blanquet 1964]. This made it possible to determine the state of preservation of the communities and the directions of their transformations. The relevés were gathered in homogeneous, preferentially large stands. In the case of small-area phytocoenoses, the relevés covered the whole patch. The phytosociological nomenclature and the syntaxonomical appendix are based on Oberdorfer [1994] and Matuszkiewicz [2005]. The species names of vascular plants are given according to Mirek *et al.* [2002].

RESULTS

1. Distribution

The *Gnaphalio uliginosi-Eleocharitetum acicularis* association was found in seven fish-breeding ponds in Silesia in south-western Poland. Patches developed rarely on the exposed bottoms of these ponds, on damp, usually sandy or sandy-muddy soil. They were found in seven fish-breeding ponds (Fig. 1):

- Grabownica place (Grabownica Pond) – 51. 522537 N, 17. 402387 E
- Kuźnica Dąbrowska place – 50. 979993 N, 17. 835124 E
- Pludry (Pluderskie Ponds) place – 50. 646903 N, 18. 451581 E
- Rokitki place – 51. 362617 N, 15. 844839 E
- Ruszów place (Zakonnik Pond) – 51. 394306 N, 15. 236256 E
- Utrata place (Stary Pond) – 50. 588359 N, 18. 197351 E
- Żeleźniki place – 51. 441838 N, 17. 417858 E

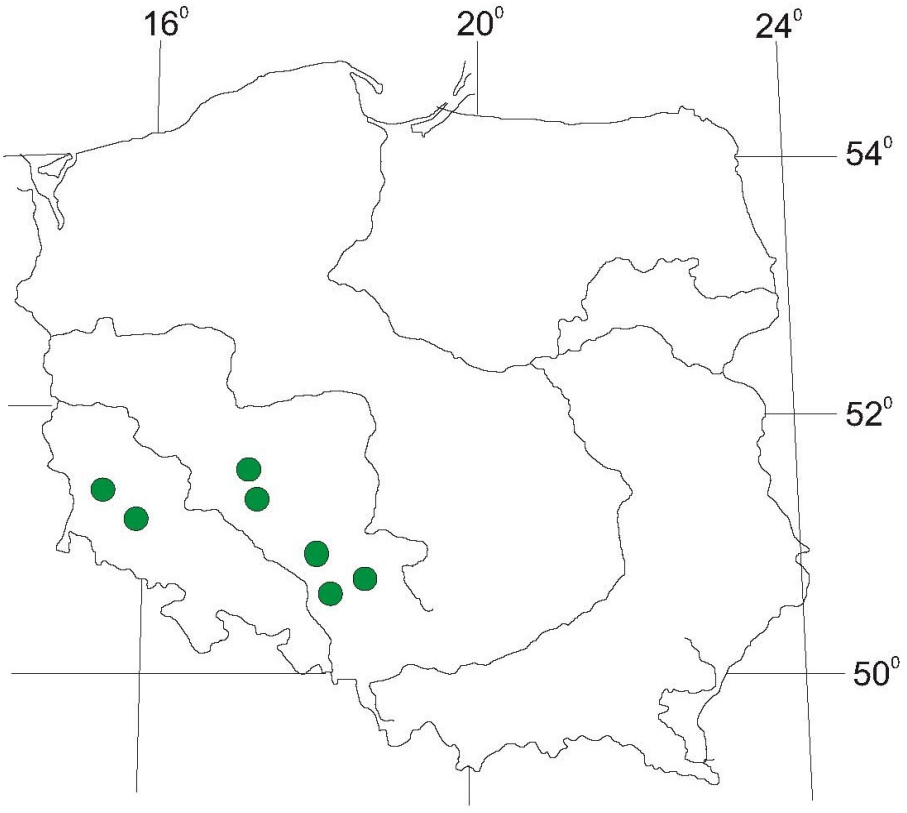

Fig. 1. Localities of *Gnaphalio uliginosi-Eleocharitetum acicularis* in Poland

2. Occurrence conditions

Phytocenoses of *Gnaphalio uliginosi-Eleocharitetum acicularis* usually appeared in the first or second year after pond drying and cover the area of max. 20–100 m^2. Only in the forest pond near Ruszów (Zakonnik Pond) in Bory Dolnośląskie, this association covered the area of several ha (in 2008 and 2016). *Gnaphalium uliginosum* prevailed in these stands and *Eleocharis acicularis* and *Plantago intermedia* appeared rarely. *Carex bohemica* and *Cyperus fuscus* are noted rarly (Table 1). Phytocenoses of *Gnaphalio uliginosi-Eleocharitetum acicularis* usually adjoin other communities of *Isoëto-Nanojuncetea* class, fragmentarily formed phytocenoses of *Littorelletea uniflorae* or *Bidentetea tripartitae* class. From 6 to 14 (10 on average) species per relevé and altogether 33 plant species for the total of 10 relevés were noted in this association.

DISCUSSION

Due to the floristic composition, phytocenoses of the *Gnaphalio uliginosi-Eleocharitetum acicularis* occurring in Poland were classified to the typical subassociations – *Gnaphalio uliginosi-Eleocharitetum acicularis typicum*. Three phases can be observed: initial, optimal and terminal, like other communities from *Elatini-Eleocharition ovatae* alliance and *Isoëto-Nanojuncetea* class, e.g. *Eleocharetum ovatae* [Popiela 1996, 1997, 1999, 2005, Poschlod 1996, Poschlod *et al.* 1999, Šumberová 2011, Šumberová and Hrivnak 2013]. In the first year after drying up its initial phase appeared. It was created by small concentrations of *Gnaphalium uliginosum* and *Eleocharis acicularis*, *Cyperus fuscus* and *Limosella aquatica* (Table 1, relevé 1, 4). If a pond is being dried for a period longer than one year, the association form will change and optimal phase will appear in which *Gnaphalium uliginosum* prevails (Table 1, relevé 2–3, 5–6, 8–10). In following years, if a pond is not flooded, the terminal phase will appear and plants with large biomass will be more commonly found. *Carex bohemica* and, in smaller amounts, the species of *Bidentetea tripartiti* class, particularly *Bidens tripartita* and *Polygonum persicaria*, most often then prevail (Table 1, relevé 7). At that time, association often is being formed in mosaic manner. Low-growing species create little stands in free spaces between tall plants, especially in damper places. At this phase, *Limosella aquatica* and *Cyperus fuscus* very often totally disappear. Species of *Bidentetea tripartitae* class can be more often observed. If a pond is not flooded, wetland plants of optimal and terminal phase usually appear in the middle of May or at the beginning of June.

Table 1. *Gnaphalio uliginosi-Eleocharitetum acicularis* Passarge 1999 in Poland

Relevé number	1	2	3	4	5	6	7	8	9	10	C
Date	04.08 2000	11.09 2001	29.08 2002	17.09 2002	20.09 2002	22.09 2005	13.08 2008	19.08 2008	28.08 2015	17.09 2016	
Locality	P	KD	U	G	R	Ż	R	Ru	Ru	Ru	
Cover of herb layer (%)	60	70	60	55	85	90	80	80	90	90	
Area of relevé (m^2)	10	10	10	20	20	20	20	100	50	50	
Number of species in relevé	9	12	12	10	6	7	14	9	8	9	
Ch. *Gnaphalio uliginosi-Eleocharitetum acicularis*											
Gnaphalium uliginosum	3	4	4	3	5	5	4	5	5	5	V
Eleocharis acicularis	1	1	1	.	+	2	1	1	+	+	V
Ch. *Elatini-Eleocharition ovatae*											
Carex bohemica	2	.	.	1	.	+	.	1	1	+	III
Cyperus fuscus	.	1	+	.	+	+	.	.	1	+	III
Limosella aquatica	.	+	+	.	.	+	.	+	+	+	III
Eleocharis ovata	.	+	.	.	.	.	1	+	.	.	II
Ch. *Cyperetalia fusci*											
Potentilla supina	.	+	+	+	+	.	.	.	.	.	II
Ch. *Isoëto-Nanojuncetea*											
Plantago intermedia	+	1	+	.	.	.	2	+	+	1	IV
Peplis portula	.	.	.	.	.	.	+	+	.	+	II
Ch. *Bidentetea tripartiti*											
Bidens tripartita	+	+	+	+	.	.	2	.	.	.	II
Polygonym persicaria	.	.	+	.	.	.	2	+	+	+	II
Bidens radiata	.	.	.	.	+	+	1	.	.	.	II
Polygonum hydropiper	.	.	.	.	+	+	1	.	.	.	II
Echinochloa crus-galli	+	+	+	.	.	.	.	.	.	.	II

Chenopodium rubrum	.	.	.	.	.	.	.	.	+	+	I
Rumex maritimus	+	.	+	.	.	.	.	.	.	.	I
Accompanying species											
Hydrocotyle vulgaris	.	.	.	1	.	.	2	.	.	.	I
Veronica scutellata	.	.	.	+	.	.	1	.	.	.	I
Polygonum aviculare	+	.	.	+	.	.	.	.	.	.	I

Sporadic: Ch. *Elatini-Eleocharition ovatae*: *Carex viridula* 7(+); *Elatine triandra* 7(+); *Lindernia procumbens* 4(+). Ch. *Isoëto-Nanojuncetea*: *Jucus bufonius* 4(1); *Mentha pulegium* 2(+). Ch. *Bidentetea tripartiti*: *Bidens cernua* 7(+); *Ranunculus sceleratus* 3(+). Accompanying species: *Alisma plantago-aqutica* 1(+); *Alopecurus geniculatus* 3(+); *Batrachium circinatum* 2(+); *Callitriche verna* 2(+); *Chenopodium album* 8(+); *Juncus articulatus* 4(1); *Phragmites australis* 1(+).

Explanations: G – Grabownica, KD – Kuźnica Dąbrowska, P – Pludry, R – Rokitki, Ru – Ruszów, U – Utrata, Ż – Żeleźniki; Ch. – characteristic species, C – constancy

CONCLUSION

Intense breeding is maintained in most fish cultivation farms and also ponds are flooded at most times of the year. Reconstruction and deepening of a pond or, rarely, water deficit are often the reason to leave a reservoir dried for a longer period of time. This enables development of phytocoenoses of wetland annuals. Nowadays, in Poland, these are most often water-less fish breeding ponds. Therefore, it can be assumed that some of them can be a potential habitat for them. Long-term water deficit in ponds also causes that this association disappears as a consequence of natural succession until ponds are flooded again and then periodically dried. Pond near Rokitki can serve as an example. In 2002 phytocenoses of this association were observed there. It has not been flooded for many years and on the bottom there appeared sedges of *Magnocaricion* and meadow communities of *Molinio-Arrhenatheretea* class. In 2008, as a result of repeated pond flooding and periodical drying, phytocenoses of *Gnaphalio uliginosi-Eleocharitetum acicularis* appeared again in this fish-breeding pond. The greatest danger to the existence of this community in Poland is not, as it may seem, too rare water flushing in ponds, but strong fertilization and frequent elutration. Despite the long period of drying, in such ponds phytocenoses of *Gnaphalio uliginosi-Eleocharitetum acicularis* do not appear.

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Gnaphalio uliginosi-eleocharitetum acicularis PASSARGE 1999, NOWY ZESPÓŁ ROŚLINNY W POLSCE

Streszczenie. Zbiorniki wodne są bardzo cennymi miejscami florystycznymi w Polsce. Wśród nich najważniejsze dla zachowania różnorodności biologicznej flory są stawy rybne. Długookresowy proces oddziaływania ludzkiego na tego typu siedliska powodował zakłócenia w ich równowadze biologicznej. Zmiany w systemie wodnym, rozwój przemysłowy i chemizacja rolnictwa, zwłaszcza w okresie ostatnich dwóch stuleci, doprowadziły do zaniku wielu gatunków roślin oraz zbiorowisk

roślinnych. Zespół *Gnaphalio uliginosi-Eleocharitetum acicularis* Passarge 1999 z klasy *Isoëto-Nanojuncetea* Br.-Bl. et Tx. 1943, po raz pierwszy został opisany w Niemczech. Rośnie na piaszczystych lub mulistych brzegach rzek, starorzeczach i w stawach hodowlanych. W Polsce *Gnaphalio uliginosi-Eleocharitetum acicularis* nie był dotychczas notowany. Fitocezozy tego zbiorowiska były opisywane wielokrotnie, ale nie były klasyfikowane do rangi zespołu. Podczas obecnych badań geobotanicznych *Gnaphalio uliginosi-Eleocharitetum acicularis* został stwierdzony w siedmiu stawach rybnych w południowo-zachodniej Polsce. Prace terenowe przeprowadzono w latach 2000–2016.

Słowa kluczowe: klasa *Isoëto-Nanojuncetea*, zbiorowiska namułkowe, stawy hodowlane, fitosocjologia, Europa Centralna